Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

THE GEOGRAPHICAL DISTRIBUTION OF NORTH DAKOTA PLANTS

O. A. Stevens

The fact that North Dakota is only partially included within the limits used by eastern and western manuals, and that its northern boundary is also that of the United States, makes the composition and distribution of its flora a question of considerable interest. The present paper is offered as a preliminary analysis of our knowledge of the subject. It is based upon the records published by Bergman (3)[1] and upon the writer's observations made during occasional visits to nearly all parts of the state in the years 1910 to 1919. The number of vascular plants found within the state as listed by Bergman is 966. This is by a conservative limitation of species. Lunell (8), using narrow specific limits, lists about 1,300. It is thus seen that the number is small as compared with that of other states. This is probably due to a comparative lack of diversity of conditions, as there is no unexplored area which might add materially to the list.

To a botanist unfamiliar with the plants west of the range of the eastern manuals, the first feature of interest is the western plants. To the writer it has always seemed that the most natural limit of the western forms is the Missouri River in the southern part of the state and a line continued across the state in the direction of its course there, which would be about longitude 100° 30′ to 101° 30′. A few of the western forms extend eastward as far as the Sheyenne River. A preliminary division into general groups according to the distribution of the plants in the state gave the following results:

I.	Eastern; not west of Red River, Devil's Lake, or Turtle Mountains	25%
II.	Eastern; reaching the Missouri River	10%
III.	Western; west of the Missouri River	11%
IV.	Western; extending east to the Sheyenne River	8%
V.	Cosmopolitan	30%
VI.	Introduced	16%

These figures are somewhat unsatisfactory, especially as to the second group, this being not well separated from the first. There is an apparent lack of records from the southern two thirds of the state from Jamestown west to the Missouri River. It is evident, however, that the western element is comparatively small. A more critical study of some of the principal families and orders with regard to their North American distribution shows the following results when grouped as in the preceding list. The number of species included in eastern (10) and Rocky Mountain (4) manuals is added to show whether the families are better represented in the east or in the west.

---

[1] The nomenclature and arrangement of his work is followed in this paper.

TABLE 1. *North American range of North Dakota plants*

	I	II	III	IV	V	VI	Total	N. E. U. S.	R. Mt.
Ranunculaceae	2	6	4	0	16	1	29	93	89
Brassicaceae	2	1	4	1	15	23	46	102	133
Scrophulariaceae	2	1	2	1	15	3	24	115	121
Boraginaceae	0	1	3	1	5	5	15	49	67
Lamiaceae	4	0	1	0	12	4	21	119	28
Rosaceae	4	4	4	5	14	1	32	214	94
Fabaceae	6	3	7	5	20	10	51	166	201
Asteraceae	25	7	19	2	53	12	118	428	463
Liliales	8	3	5	0	12	1	29	174	62
Cyperaceae	6	2	2	1	48	0	59	333	99
Poaceae	18	0	10	3	64	21	116	378	206
Total	77	28	61	19	274	81	540		
Percent	14	5	11	4	51	15	—		

In table 1, column I includes only the strictly eastern plants; such species as are found only in the eastern part of the state but occur in the western United States or Canada are placed in column V. Columns II and IV are similarly affected. Various difficulties arise in such a compilation, chiefly through incomplete records. The statements of distribution as given in the manuals are frequently insufficient, and original or detailed records must be consulted. For general distribution chief reliance has been placed upon the statements of Rydberg (11).

THE WESTERN PLANTS

These are quite conspicuous in early spring on the hills, where we find such plants as: *Phlox Hoodii*, *Mertensia lanceolata*, *Viola Nuttallii*, *Orophaca caespitosa*, *Potentilla concinna*, and *Carex filifolia*. In late spring and early summer are found: *Paronychia sessiliflora*, *Eurotia lanata*, *Eriogynum flavum*, *E. multiceps*, *Chamaerhodos erecta*, *Thermopsis rhombifolia*, *Astragalus pectinatus*, *Pentstemon cristatus*, *P. angustifolius*, and *Oreocarya glomerata;* on flats or gentle slopes below the hills, *Musineon divaricatum* and *Lomatium foeniculaceum*. On bare clay buttes in the "Bad Lands" and adjacent territory, *Pachylophus caespitosus* and *Chrysothamnus graveolens* are striking plants. The northern sides of many buttes are covered on the upper parts with *Juniperus horizontalis*, this being one of the plants which is absent in the eastern part of the state although it ranges to the Atlantic coast. *Artemisia cana* is a conspicuous low shrub on the hillsides and flats below; this is the nearest approach to "sage-brush," as *A. tridentata* has been collected only at one point (Medora).

Some species are reported only from the extreme western part of the state, such as:

Delphinum bicolor
Physaria didymocarpa
Stanleya pinnata
Sarcobatus vermiculatus
Abronia micrantha
Gilia congesta
Phacelia leucophylla
Homalobus caespitosus
Kentrophyta montana
Sideranthus grindelioides
Pyrrocoma lanceolata
Stenotus armerioides
Townsendia exscapa
Calochortus Nuttallii
Juniperus communis
Juniperus scopulorum

Others, as before noted, extend eastward to the Sheyenne valley although less common eastward. Among these are: *Viola Nuttallii, Atriplex Suckleyana*, *Chamaerhodos erecta*, *Astragalus racemosus*, *A. bisculcatus*, *Lomatium foeniculaceum*, and *Carex filifolia*.

The western plants belong to the great plains area, ranging chiefly from Nebraska to Saskatchewan. A few, such as *Gilia congesta, Pentstemon angustifolius*, *Hedeoma nana*, *Kentrophyta montana*, and *Picradenia pumila* seem to have a rather limited range (Colorado, Wyoming, Utah). Many extend as far south as New Mexico (see lists on later page), while the following go west into the Pacific coast states:

Ranunculus glaberrimus
Delphinum bicolor
Arabis Holboellii
Atriplex confertifolia
Navarettia minima
Allocarya scopulorum
Phacelia leucophylla
Mertensia lanceolata
Potentilla multisecta
Chamaerhodos erecta
Lavauxia brachycarpa
Rhus trilobata
Gaertneria acanthicarpa
Erigeron pumilus
Pyrrocoma lanceolata
Artemisia cana
Artemisia dracunculoides
Artemisia tridentata
Crepis occidentalis
Calochortus Nuttallii
Eriocoma cuspidata
Poa Buckleyana

THE EASTERN PLANTS

Species found along the Red River and not extending into western North America are:

Actaea spicata
Aquilegia canadensis
Clematis virginiana
Anemone quinquefolia (rare)
Menispermum canadense
Viola conspersa (rare)
Caulophyllum thalictroides
Sanguinaria canadensis
Xanthoxylum americanum
Corylus americana
Leptandra virginica (rare)
Penthorum sedoides
Silphium perfoliatum
Aster sagittifolius
Allium tricoccum
Uvularia perfoliata
Uvularia grandiflora
Trillium cernuum
Festuca nutans
Oryzopsis melanocarpa

Others, which occur only in the eastern part of the state, range west through Canada or are found in the Rocky Mountain region of the United States. Such are:

Anemone virginiana
Impatiens biflora
Rhamnus alnifolia (rare)
Heliopsis scabra
Moldavica parviflora
Lathyrus palustris
Lathyrus venosus
Meibomia grandiflora
Petasites sagittata
Vagnera racemosa
Disporum trachycarpum
Carex Deweyana
Scolochloa festucacea
Hystrix Hystrix
Dryopteris cristata
Matteucia Struthiopteris

EASTERN LIMITS OF PRAIRIE PLANTS

Many species common to the hills and higher prairie west of the Red River valley extend eastward into the prairie region of western and southwestern Minnesota. Upham (12) lists about 100 species which reach their eastern limits there. Most of these are common prairie plants in North Dakota, although absent from the lower ground of the valley or found only in certain places as upon old lake beaches and introduced with gravel on railroad grades. Such are:

Malvastrum coccineum
Asclepias speciosa
Pentstemon albidus
Castilleja sessiliflora
Meriolix serrulata
Gaura coccinea
Lepargyrea argentea
Anogra pallida
Lomatium orientale
Cymopterus acaulis
Gutierrezia Sarothrae
Chrysopsis villosa
Sideranthus spinulosus
Brauneria angustifolia
Ratibida columnaris
Gaillardia aristata
Artemisia frigida

Others, associated with these, occur much farther east, as: *Erysimum asperum*, *Eleagnus argentea*, and *Aster ptarmicoides*.

LIFE-ZONE DISTRIBUTION

As shown by the map (fig. 1), North Dakota lies almost entirely within the Transition Life Zone, the Canadian approaching closely on the northeast, the Upper Austral[2] on the south and west. Of the Transition Zone, Merriam (9) has stated that it is "as a whole, characterized by comparatively few distinctive animals and plants, but rather by the occurrence together of southern species which here find their northern limit, and northern species which here find their southern limit."

---

[2] No attempt is made in this paper to distinguish between a humid and an arid portion of these zones. Sonoran as referred to on later pages is included in Upper Austral.

CANADIAN ZONE SPECIES

Upham (12) has given a list of about 75 northern species which reach their southern limit in the basin of the valley of the Red River of the North, but very few of these are known in North Dakota. The few Canadian Zone plants which occur in the state are found in the Turtle Mountains and Pembina Mountains (as far south as Milton), these being outlying points cut off from the body of the zone by a distance of 100 miles or more. The following species may be mentioned:

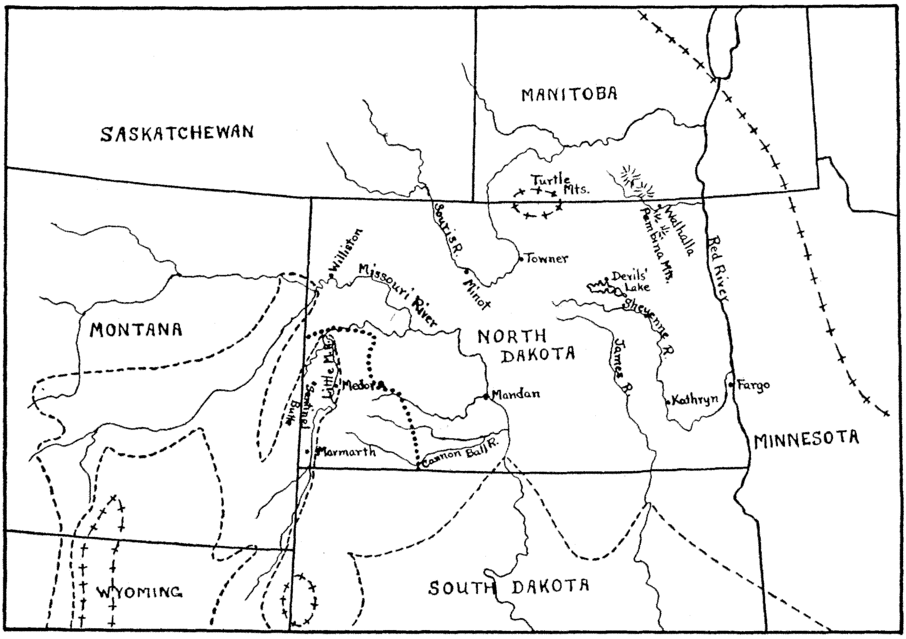

FIG. 1. Sketch map of North Dakota and adjoining states showing localities mentioned and life-zone boundaries as given by United States Biological Survey.[3] + + + lower limit of Canadian Zone;—upper limit of Upper Austral Zone (Transition Zone between); . . . southern limit of glaciated area in North Dakota.

Anemone Hudsoniana	*Oxytropis deflexus*
Corylus rostrata	*Mitella nuda*
Geranium Bicknellii	*Ribes triste*
Polygala Senega	*Circaea alpina*
Pyrola asarifolia	*Lepargyrea canadensis*
Arctostaphylos Uva-ursi	*Cornus canadensis*

---

[3] According to the fourth provisional map (1910). Mr. Vernon Bailey, who has read the manuscript of this paper, writes that in a report on the mammals of North Dakota which he has about completed, he has extended the Upper Austral limit to the mouth of the Cannon Ball River and a little way up that river; also a little farther in the western valleys.

Erigeron lonchophyllus	*Corallorhiza multiflora*
Achillea multiflora	*Cinna latifolia*
Senecio eremophilus	*Avena Torreyi*

It is noteworthy that most of these are plants of wide distribution in North America except Oxytropis, Avena, and the three composites, which are western. Of the foregoing, Anemone, Pyrola, Avena, and Erigeron are recorded from Devil's Lake, the last-named only from there. Another touch of Canadian Zone plants is evident in deep ravines at Kathryn where *Pyrola secunda*, *Corylus rostrata*, and *Circaea alpina* have been found. *Oxytropis splendens* occurs throughout the northern part of the state, but not over 50 miles southward so far as known.

UPPER AUSTRAL SPECIES

This zone reaches the borders of the state at three points, *viz.*: the valley of the Missouri River on the south and northwest and that of the Little Missouri on the southwest. *Pentstemon grandiflorus* is common along the Missouri River at least as far as Mandan and up the Cannon Ball for some distance; *Talinum parviflorum*, *Eriogynum annuum*, *Specularia perfoliata*, *Erigeron caespitosus*, *Leptilon divaricatum*, *Munroa squarrosa*, *Diplachne fascicularis*, and *Pellaea atropurpurea* are known only from the lower Missouri; *Atriplex confertifolia*, *Sarcobutus vermiculatus*, *Abronia micrantha*, and *Astragalus gracilis* (Marmarth, Stevens in 1918), only from the Little Missouri. *Clematis ligusticifolia*, *Psoralea lanceolata*, *Aster pauciflorus*, and *Oryzopsis micrantha* are known from the upper Missouri as well. (For further notes on austral species see under "Comparison with the Flora of New Mexico.")

A considerable representation of austral forms is found also in the southeastern part of the state where the Sheyenne River turns northward. From here only is known *Bouteloua hirsuta;* other noteworthy species are: *Pentstemon grandiflorus*, *Mimulus Geyeri*, *Bacopa rotundifolia*, *Verbena stricta*, *Lythrum alatum*, and *Cenchrus tribuloides*. To this list Mr. Reynold Shunk added in 1917: *Euonymus atropurpureus*, *Sicyos angulatus*, and *Cyperus diandrus*.

SAND DUNE SPECIES

Two small areas of drifting sand occur in the state, one at the locality last mentioned, the other near Towner. From these only are recorded: *Euphorbia Geyeri*, *Petalostemon villosum*, *Lygodesmia rostrata*, *Cyperus Schweinitzii*, and *Redfieldia flexuosa*. From near Towner we have *Cycloloma atriplicifolium* and *Andropogon Hallii* which do not elsewhere in the state occur so far north.

RECORDS OF SPECIAL INTEREST

At Fargo there is a slight intermingling of northern and southern species. *Lappula americana*, which occurs there, must reach nearly its southeastern limits in that region; it is reported as far as Nebraska (11) and Iowa (10) but from Minnesota for the first time in 1901 (13) from farther north. On the Minnesota side near Fargo is a colony of *Petasites sagittata* which seems to be the most southeastern point known for that species. *Pyrola elliptica* and *Viola conspersa* are found in the same piece of aspen woods. *Ilysanthes dubia*, an austral species, has been found in quantity at Wild Rice which is ten miles farther south. *Celtis occidentalis*, which extends irregularly farther north, is frequent at Fargo.

At Walhalla there is a typical butte, said by Willard (14) to be perhaps the easternmost in the United States. Upon this grow a number of plants which are otherwise found only in the western part of the state, such as *Eriogynum flavum*, *Artemisia cana*, and *Juniperus horizontalis*. In the woods of the river near by occur a number of woodland plants which are known from no other locality in the state: *Mitella nuda*, *Rhamnus alnifolia*, and *Asarum acuminatum*, which are purely eastern species; also *Cardamine pennsylvanica*, *Petasites sagittata*, *Leptorchis Loeselii*, *Carex leptalea*, and *Cinna latifolia*, which also occur in western North America.

From Sentinel Butte and Medora only, is recorded *Dasiphora fruticosa*. This is a Canadian to Arctic Zone plant of wide distribution and these stations are perhaps to be regarded as cut off from the Black Hills region, but it seems strange to find this plant where there is a prominent representation of austral forms. Likewise, *Juniperus horizontalis*, which is mainly a Canadian Zone species, is common on the buttes and hills along the Missouri and westward.

The distribution of the two species of lupine (*Lupinus argenteus* and *L. pusillus*) extends, as far as known, about to the southern limit of the glaciated area as indicated by Leonard (7).

INTRODUCED SPECIES

Of the introduced species, the abundance of Brassicaceae and Chenopodiaceae (including such recent introductions as *Erucastrum Pollichii*, *Camelina dentata*, and *Axyris amaranthoides*), and the scarcity of Polygonaceae (*Rumex* spp. and *Persicaria* forms) and of Euphorbiaceae are noteworthy. Of Compositae, *Carduus arvensis* and *Sonchus arvensis* are by far the most important.

The observations made by Upham (12) thirty years ago are interesting in comparison with present conditions. He notes of *Thlaspi arvense*: "long established and very abundant in the vicinity of Winnipeg, recently spreading into Minnesota and North Dakota." Of *Taraxacum officinale:* "frequent along roadsides, in pastures, etc., about Winnipeg and plentiful at the west end of the main street in St. Vincent; generally rare or absent throughout the Red River Valley." Both of these plants have since become particularly abundant in the valley. He also notes the absence of *Ambrosia trifida* (native weed) from the district about Langdon where it is absent still. *Sonchus arvensis* he does not mention, it having been introduced in Manitoba a few years later and being now common through the valley and spreading farther.

Neslia paniculata and *Camelina sativa* seem to be restricted mainly to the northeastern two or three counties, *Camelina dentata* being widely distributed in flax. Certain Poaceae are especially abundant and characteristic: *Avena fatua*, *Hordeum jubatum*, and *Agropyron repens*. *Chaetochloa glauca*, *C. viridis*, *Echinochloa crus-galli*, and *Panicum capillare* are also very abundant but perhaps less characteristic. *Syntherisma sanguinalis* is repeatedly introduced in southern-grown millet seed but has not been collected in the state even in adventive condition. *Plantago lanceolata* has been collected a few times but apparently does not become established.

COMPARISON WITH THE BIOLOGICAL SURVEY REPORTS

Considerable difficulty has been found in trying to correlate the distributional data with those of previous publications dealing with life zones. The Rocky Mountain region has been described in considerable detail, but in the plains region, as noted by Cary (6), the zone limits are less well marked. Trees have been used to a great extent in indicating the boundary lines of the zones, and North Dakota is especially lacking in trees.

Pinus scopulorum is mentioned by Cary (5) as "the characteristic Transition tree," but in North Dakota it is found only on the hills in the extreme southwestern part of the state where the Austral Zone invades the river valleys. *Populus tremuloides*, according to the same author, "is perhaps the best characterizing tree of the Canadian Zone" in Wyoming (6). He also mentions it as "restricted to the Canadian Zone" in Colorado, while Bailey (2) lists it for the same in New Mexico. Apparently it is most abundant in this zone east of the mountains, but it is common through the Transition Zone and extends half way through the Upper Austral in the Mississippi Valley region. *Quercus macrocarpa* is noted as growing in the Transition Zone in Wyoming (6), but in the Mississippi Valley region where it is more abundant it extends from the Canadian southward well into the Lower Austral.

Of the trees and shrubs listed by Cary as Upper Sonoran in Wyoming, at least *Salix amygdaloides*, *S. fluviatilis*, *Atriplex argentea*, *Amorpha nana*, and *Gutierrezia Sarothrae* are common in North Dakota Transition, while the same may be said of fully one fourth of the "herbaceous plants." In the same paper *Psoralea argophylla* is listed as Transition, although it is common on the plains through Upper Austral; *Actaea rubra*, *Sieversia ciliata*, and *Heracleum lanatum*, listed as Canadian, are common in North Dakota Transition.

COMPARISON WITH THE FLORA OF NEW MEXICO

The fact that Wooton and Standley (15) have indicated the zonal distribution for practically all the species found in New Mexico has made it desirable to examine the distribution of such North Dakota plants as occur there. A tabulation shows that 418 of the 966 North Dakota plants (43.3%) are recorded in New Mexico. Of these the distribution in the latter state is:

Introduced	68	Transition	77
Aquatic or not stated	42	Transition to Canadian	15
Lower Sonoran	3	Transition to Hudsonian, etc.	3
Upper Sonoran	126	Canadian or higher zones	11
Sonoran to Transition	73		

(Of those listed here as Upper Sonoran, many range also in Lower Sonoran, but only their northward distribution is considered here.)

Fourteen of the Sonoran species have been mentioned in a preceding paragraph as entering North Dakota at one or more of the three points where that zone touches the state. About three fourths of the number extend into Transition, and these it seems convenient to divide into two groups. The following seem to extend only part way into Transition (occasional over the area southwest of the Missouri or in the southern part of the state east of that river):

Myosurus minimus
Polanisia trachysperma
Euphorbia serpens
Euphorbia glyptosperma
Euphorbia Geyeri
Cycloloma atriplicifolium
Eurotia lanata
Parietaria pennsylvanica
Plantago Purshii
Acerates viridiflora
Solanum rostratum
Hedeoma nana
Lupinus pusillus
Parosela enneandra
Strophostyles pauciflora
Anogra albicaulis
Opuntia fragilis
Opuntia polycantha
Iva axillaris
Gaertneria acanthicarpa
Chrysothamnus graveolens
Stenotus armerioides
Townsendia exscapa
Hymenopappus filifolius
Bahia oppositifolia
Tetraneuris acaulis
Helianthus petiolaris
Tradescantia occidentalis
Yucca glauca
Cyperus inflexus
Cyperus Schweinitzii
Scirpus americanus
Carex filifolia
Andropogon Hallii
Sorghastrum avenaceum
Sporobolus cryptandrus
Sporobolus asperifolius
Bulbilis dactyloides

The following species of the Sonoran list extend through the greater part of Transition in North Dakota, most of them being common plants over a large part of the state:

Erysimum asperum
Malvastrum coccineum
Viola pedatifida
Atriplex hastata
Atriplex argentea
Amaranthus blitoides
Allionia hirsuta
Salix amygdaloides
Salix interior
Rumex persicarioides
Polygonum lapathifolium
Androsace occidentalis
Solanum triflorum
Castilleja sessiliflora
Heliotropum spathulatum
Lithospermum linearifolium
Onosmodium occidentale
Verbena hastata
Lycopus lucidus
Lycopus americanus
Amorpha canescens
Petalostemon purpureum
Astragalus crassicarpus
Astragalus missouriensis
Glycyrrhiza lepidota
Vicia sparsiflora
Gaura coccinea
Meriolix serrulata
Onagra pallida
Lomatium orientale
Lacinaria punctata
Grindelia squarrosa
Sideranthus spinulosus
Aster oblongifolius
Aster multiflorus
Coreopsis tinctoria
Bidens frondosa
Artemisia frigida
Lactuca ludoviciana
Lygodesmia juncea
Sagittaria arifolia
Typha latifolia
Scirpus campestris
Scirpus atrovirens
Eleocharis Engelmannii
Eleocharis palustris
Carex gravida
Andropogon furcatus
Panicum virgatum
Stipa comata
Stipa spartea
Calamovilfa longifolia
Schedonnardus paniculatus
Phragmites Phragmites
Distichlis spicata
Puccinellia airoides
Elymus Macounii

Of the New Mexican species recorded for Transition the following are common also in the Upper Austral southward from North Dakota (based chiefly upon the writer's knowledge of them in eastern Kansas):

Anemone canadensis
Anemone cylindrica
Oxalis violacea
Urtica gracilis
Steironema ciliatum
Apocynum hypericifolium
Gratiola virginiana
Ribes aureum
Epilobium adenocaulon
Epilobium lineare
Sanicula marylandica
Washingtonia longistylis
Galium triflorum
Solidago missouriensis
Solidago serotina
Heliopsis scabra
Carex lanuginosa
Phalaris arundinacea
Muhlenbergia mexicana
Agrostis hyemalis
Sphenopholis obtusata
Koeleria cristata

Poa pratensis
Panicularia nervata
Filix fragilis
Equisetum arvense

The remaining few species to be mentioned may be tabulated as follows:

Species	in New Mexico	in North Dakota
Euphorbia serpens	Lower Sonoran	Enters Transition slightly
Cyperus erythrorhizos	" "	" " "
Polygonum emersum	" "	Common through Transition
Disporum trachycarpum	Transition to Canadian	Scarcely below Canadian
Carex aurea	" " "	Somewhat into Transition
Calamagrostis canadensis	" " "	" " "
Pyrola secunda	" " "	In Transition locally
Pyrola elliptica	" " "	" " "
Rumex occidentalis	" " "	Through Transition generally
Chamaenerion angustifolium	" " "	" " "
Heracleum lanatum	" " "	" " "
Androsace occidentalis	" " "	" " "
Triglochin palustris	" " "	Reaches Austral limits
Juncus longistylis	" " "	" " "
Calochortus Nuttallii	" " "	Near Austral limit only
Rudbeckia laciniata	" " "	Through Transition and Austral farther south
Vagnera stellata	" " "	Through Transition and Austral farther south
Agrostis hyemalis	" " "	Through Transition and Austral farther south
Dasiphora fruticosa	Transition to Arctic Alpine	(Noted under "Records of Special Interest")
Viola adunca	Transition to Hudsonian	Agrees so far as it occurs
Arctostaphylos Uva-ursi	" " "	Mainly Canadian
Oxytropis deflexus	Canadian	Canadian
Circaea alpina	"	"
Corallorhiza multiflora	"	"
Alsine longifolia	"	Well through Transition
Panicularia borealis	"	" " "
Agropyron Richardsonii	"	" " "
Agropyron caninum	Hudsonian	" " "
Pyrola asarifolia	Canadian to Hudsonian	Canadian
Oryzopsis asperifolia	" " "	"
Zygadenus elegans	" " "	Well through Transition
Juniperus siberica	" " "	Only in southwest at Austral limit
Hierochloe odorata	Hudsonian to Arctic Alpine	Through Transition in eastern N. D.

AGRICULTURAL COLLEGE,
NORTH DAKOTA.

LITERATURE CITED

1. **American Ornithologists' Union Committee.** Check list of North American birds. 3d ed. New York, 1910. Fourth provisional zone map of North America (U, S. Biological Survey) as frontispiece.

2. **Bailey, V.** Life zones and crop zones of New Mexico. North American Fauna no. 35. U. S. Dept. Agric., 1913.
3. **Bergman, H. F.** Flora of North Dakota. Bien. Rept. Dir. Agric. Coll. Surv. North Dakota (1911–1912) **6**: 151–372. 1918.
4. **Coulter, J. M.**, and **Nelson, A.** New manual of botany of the central Rocky Mountains. New York, 1909.
5. **Cary, M.** A biological survey of Colorado. North American Fauna no. 33. U. S. Dept. Agric., 1911.
6. ——. Life zone investigations in Wyoming. North American Fauna no. 42. U. S. Dept. Agric., 1917.
7. **Leonard, A. G.** The surface features of North Dakota and their origin. Quart. Journ. Univ. N. D. **9**: 209–219, and map. 1919.
8. **Lunell, J.** Enumerantur plantae Dakotae Septentrionalis vasculares. Amer. Mid. Nat. **4, 5**. 1915–1918.
9. **Merriam, C. H.** Life zones and crop zones in the United States. U. S. Dept. Agric. Biol. Surv. Bull. 10. 1898.
10. **Robinson, B. L.**, and **Fernald, M. L.** Gray's new manual of botany. 7th ed. New York, 1908.
11. **Rydberg, P. A.** Flora of the Rocky Mountains and adjacent plains. New York, 1917.
12. **Upham, W.** Geographic limits of species of plants in the basin of the Red River of the North. Proc. Bost. Nat. Hist. Soc. (1890) **25**: 140–172. 1891.
13. **Wheeler, W. A.** Contributions to the flora of the Red River valley in Minnesota, Minn. Bot. Studies **2**: 569–600. 1901.
14. **Willard, D. E.** Story of the prairies. Chicago, 1902.
15. **Wooton, E. O.**, and **Standley, P. C.** Flora of New Mexico. Contr. U. S. Nat. Herb. **19**. 1915.